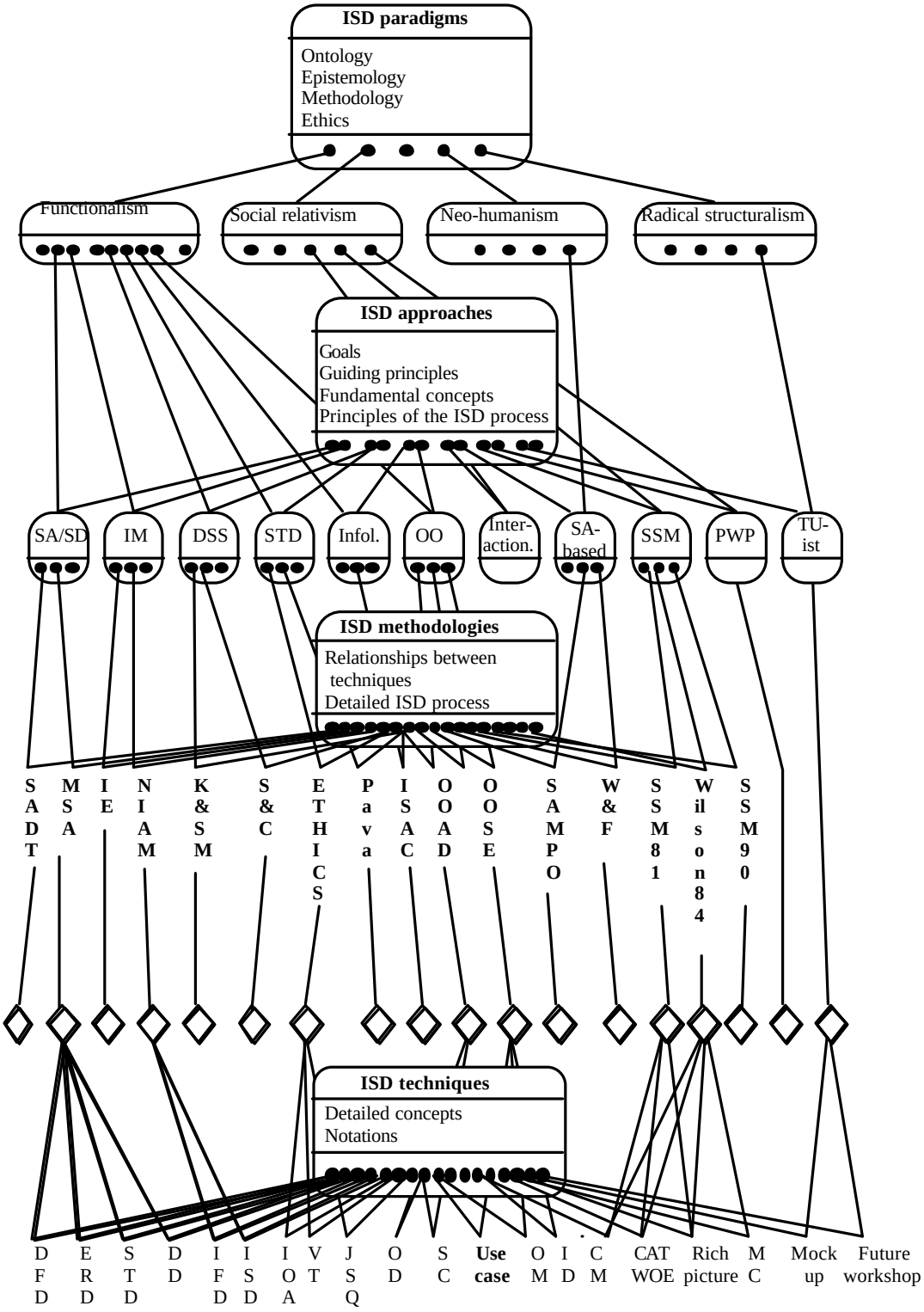

Figure 1: The hierarchy of ISD paradigms, approaches, methodologies and techniques
(Excerpt from JMIS, 2002, pp. 117-216 cf. full reference in footnote 1, next page)

Legend to Figure [1]

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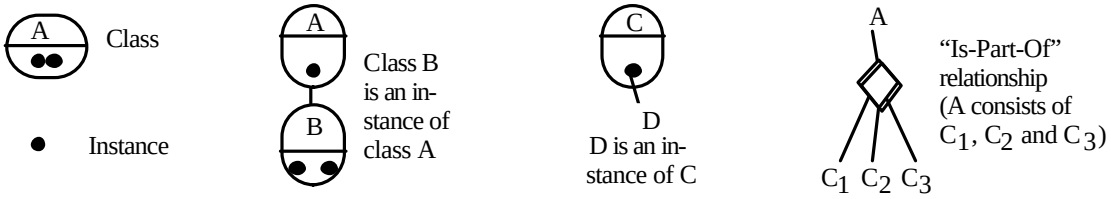
1. Notation



2. Abbreviations in order of occurrence

Approaches

SA/SD	Structured approach	Interact.	Interactionist approach
IM	Information Modelling approach	SA-based	Speech Act-based approach
DSS	Decision Support Systems approach	SSM	Soft Systems Methodology approach
STD	Socio-Technical Design approach	PWP	Professional Work Practice approach
Infol.	Infological approach	TU-ist	Trade Unionist approach
OO	Object-Oriented approach		

Methodologies

SADT	Structured Analysis and Design Technique	ISAC	Information Systems work and Analysis of Changes
MSA	Modern Structured Analysis	OOAD	Object Oriented Analysis and Design
IE	Information Engineering	OOSE	Object Oriented Software Engineering
NIAM	Nijssen's Information Analysis Method	SAMPO	Speech Act-based information analysis
K&SM	Keen and Scott Morton's (1978) methodology		Methodology with comPuter-aided tOols
S&C	Sprague and Carlson's (1982) methodology	W&F	Winograd and Flores' (1986) methodology
ETHICS	Effective Technical and Human Implementation of Computer-based Systems	SSM81	Checkland's (1980) methodology
		Wilson84	Wilson's (1984) methodology
Pava	Pava's (1983) methodology	SSM90	Checkland and Scholes' (1990) methodology

Techniques

DFD	Data Flow Diagram	OM	Object Model
ERD	Entity Relationship Diagram	ID	Interaction Diagram
STD	State Transition Diagram	CM	Conceptual Model
IFD	Information Flow Diagram	CATWOE	Customers, Actors, Transformation,
ISD	Information Structure Diagram		Weltanschauung, Owner(s), Environ-
IOA	Input/Output Analysis diagram		mental constraints
VT	Variance Table	-	Rich Picture
	Job Satisfaction Questionnaire	MC	Maltesse Cross
JSQ	Object Diagram	-	Mock up
OC	Service Chart	-	Future Workshop
SC	Use case	-	

[1] From "A Dynamic Framework for Classifying Information Systems Development, Methodologies and Approaches, *Juhani Iivari, Rudy Hirschheim and Heinz K. Klein*,**Journal of Management Information Systems (JMIS),** Winter 2000, Vol. 17, No. 3, pp. 177–216.

Table 1. Summary of the Six Functionalist ISDAs

Approach / *Features*	*Structured Approach*	*Information Modelling*	*Decision Support Systems*	*Sociotechnical Approach*	*Infological Approach*	*Object-oriented Approach*
Goal	To provide an approach that helps to produce high quality (reliable and maintainable) software in a productive way	To provide an approach for enterprise-wide development of information systems (databases) that enables coordinated development of integrated application systems and their long-term evolution	To provide an approach for developing systems to support in particular, semi-structured decision making	To provide an approach for IS development that enables future users to play a major part in the design of the system, to cater to job satisfaction objectives in addition to more technical and operational objectives, and to ensure that the new system is surrounded by a compatible well-functioning organizational system	To provide an approach that helps to ensure that really needed information systems are developed, systems which give a positive contribution to the organization, that users understand the system, and that the system is easily maintainable, portable, and efficient	To provide an approach that helps to ensure that the products are delivered to the user on time and within budget, that the products meet user requirements, that the user requests to modify the system and/or fix bugs are responded to in a timely fashion, that increasingly sophisticated products are offered to keep a competitive edge, that changes in standards and delivery technology are kept up and the project team feels motivated and successful
Guiding principles and beliefs	Separation of the essential model from the implementation model; Careful documentation to make the development process visible; Graphic notations; Top-down partionable transformation/process models to hide complexity; Unambiguous, minimally redundant, graphic specification; Balancing of models with high cohesion and weak coupling	Data form a stable basis for information systems; Separation of conceptual and internal schemas/ models; The conceptual schema is a theory of the Universe of Discourse; The conceptual schema forms the core model for an IS; Applications are built on top of the conceptual schema; IS development should be based on an engineering like rigorous methodology	The purpose of a DSS is to support rather than replace a decision; Use of a DSS is interactive; DSS use implies learning; A DSS evolves	Self-design of a work system; Minimal critical specification; Open-ended design process; Fit between the social and technical subsystems; Joint optimization; Redundant functions	Distinction between the infological and datalogical problems; An information system is a model of the object system; The infological problem should be solved before the datalogical problem; User should control the development (especially at the infological level); Levels of modelling and an integrated system of description languages allow effective user participation	Seamless analysis, design and implementation
Fundamental concepts	Essential model vs. implementation model; Transformation (process); Data flow; Data store; Terminator; Module; Cohesion; Coupling	Universe of Discourse; Information/database; Conceptual schema; Internal schema; External schema; Entity; Attribute; Relationship	Semi-structured decision; Database; Model base; Specific DSS; DSS generator	Technical system: Social system: Variance; Unit operation; Technical needs; Social needs (job satisfaction)	Infological problem vs. datalogical problem; Object system; Activity; Material flow; Information flow; Information/ message set; Precedence relation; File; File consolidation; Process consolidation	Problem domain vs. implementation domain; Object and class; Encapsulation; Information (implementation) hiding; Inheritance; Polymorphism; Communication between objects
Principles of the ISD process	A step by step process at the detailed level of analysis and design activities; Situation dependent at the 'strategic' level (water-fall, prototyping, concurrent)	Incremental conceptual schema design; View integration	Evolutionary (adaptive) development	User participation; Socio-technical design; Evolution	Information analysis based on top-down precedence and component analysis; Design based on bottom-up process and file consolidation	Iterative and incremental development; Reuse

Table 2. Summary of the Five Non-Functionalist ISDAs

Approach / *Features*	*Interactionist approach*	*SA-based approach*	*SSM approach*	*Trade Unionist approach*	*Professional Work Practice approach*
Goals	To shed light on the social issues surrounding organizal change and implementation of information systems	To provide a methodology for modeling communicative action in organizations, especially speech acts of changes: creating, maintaining, reporting, modifying and terminating organizational commitments	To provide a learning methodology to support debate on desirable and feasible changes	To develop conditions for effective worker participation in order to support democracy at work and quality of work	To promote increased professionalism of IS designers
Guiding principles and beliefs	An information system is a social object with social meanings serving different interests; The infrastructure supporting the focal system is critical; Control over the infrastructure is a political process; Commitments of the past constrain the future; IS development is social action of negotiation	An information system is a social system only technically implemented; An information system is a communication system (mediating speech acts); ISD is formalization of professional (work) language	Use of notional system models called "human activity systems" to illuminate different Weltanschauungen which may be applied to any social system; An information system is a system to support the truly relevant human activity system	Design of computer support is design of conditions for work; Craftmanship as the ideal of work; A collective resource approach based on trade union participation	Systems developers must reflect systematically their practice; Methodologies can support inspired practitioners but cannot replace experience; ISD situations are different, requiring different working practices; Effective IS development requires the handling of two types of principles: performance principles and management principles
Fundamental concepts	Information systems as institutions; Social use of information systems; Complex and overlapping negotiation context; Non-neutrality of IS resources	Speech acts; Illocutionary points; Propositional content; Discourses/conversations	Weltanschauung; Human Activity Systems; Root definition; Relevant system	Computers as tools (under the control of each worker)	Performance vs. management; Reflection vs. action; Visions vs. present reality; Product-oriented vs. process oriented; Analysis vs. design; Planning vs. evaluation
Principles of the ISD process	N/A	Discourse/conversation analysis; Analysis of the propositional content	Stream of cultural analysis; Stream of logic-based analysis	Parallel and independent process of accumulating knowledge on the part of the union; Design by doing; Cooperative design	All the above dualities are mutually dependent and therefore should be per formed concurrently

Table 3. Characteristic features underlying Multiview

Goals	Multiview provides a methodology for exploration into IS development (i: SSM). More specifically, it helps in providing answers to the following questions: 1. How is the IS supposed to further the aims of the organization? (i: SSM) 2. How can it be fitted into the working lives of the people in the organization who are going to use it? (i:STD) 3. How can the individuals concerned best relate to the computer in terms of operating it and using the output from it? 4. What information processing function is the system to perform? 5. What is the technical specification of a system that will come close enough to doing the things that you have written down in the answers to the other four questions?
Guiding principles and beliefes	To develop an information system, which is complete in both technical and human terms, requires multiple viewpoints comprising the viewpoints of human activity, information analysis, socio-technical aspects, human-computer interface and technical design. The multiple viewpoints should be combined in a reasonably coherent "methodology framework" *Analysis of human activity system*: To search for a particular worldview, Weltanschauung, to form the basis for describing system requirements (i: SSM) *Information analysis*: To analyze the entities and functions of the system, independent of how the system will eventually develop *Analysis and design of the socio-technical aspects*: To produce a 'good fit' design, taking into account people and their needs and the working environment on the one hand, and the organizational structure, computer systems and necessary work tasks on the other (i: STD) *Design of the human-computer interface*: The dialogue should be related to who will be using the system. *Design of technical aspects*: Efficient technical design to ensure a quality technical system.
Fundamental concepts	Analysis of Human Activity System - Human Activity System, Weltanschauung, root definition, relevant system, conceptual model (i: SSM), rich picture Information analysis: Functional analysis - function, event, dataflow Information analysis: Data analysis - entity, relationship, attribute Socio-technical design - technical objectives, social objectives, technical alternatives, social alternatives (i: STD) Human-computer dialogue Technical aspects - processing application, information retrieval, database maintenance, control, recovery, monitoring
Principles of the ISD process	Flexibility of the process within Multiview Five stages of IS analysis and design *Analysis of human activity system*: A modification of the seven-stage model of [16] *Information analysis*: Top-down decomposition of functions based on the primary task conceptual model; construction of data flow models; verification of functional and entity models *Analysis and design of the socio-technical aspects*: Socio-technical design, user participation, (i: STD)